ON THE SUPG AND RKDG FINITE ELEMENT FORMULATIONS OF THE LEVEL SET METHOD

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In this work, we present two Finite Element (FE) formulations of the Level Set method: the Streamline-Upwind/Petrov-Galerkin (SUPG) and the Runge-Kutta Discontinuous Galerkin (RKDG) schemes. Both schemes are constructed in such a way as to minimize the numerical diffusion inherently present in the discretized Level Set equations. In the SUPG scheme, the numerical diffusion is reduced by implementing a special mass-correction procedure. The RKDG Level Set formulation is original and represents the first attempt to apply the discontinuous Galerkin Finite Element method for interface tracking. The perfomances of the schemes are demonstrated on selected two-dimensional problems: the broken dam benchmark problem and two mold-filling simulations. The problems are solved by using unstructured, triangulated meshes. Special attention is given to the issues of mass-conservation and robustness of the schemes. We also provide comparison of our results with those obtained using the Volume-of-Fluid (VOF) method.